SECTION 20

EARTHWORK; GENERAL

20-01 SCOPE: The work covered by this section of the specifications consists in furnishing all plant, labor, equipment, appliances and materials not furnished by the Government, an in performing all operations in connection with the excavating, filling and grading required for overall grading of the areas indicated; and with the excavation, trenching and backfilling for sanitary sewers, water lines and concrete-encased electric duct work to the points of connection with the building utilities 5 feet outside the building to be served; complete, in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

20-02 APPLICABLE STANDARD: The following standard of the American Association of State Highway Officials forms a part of this specification:

T 99-49 Standard Laboratory Method of Test for the Compaction and Density of Soil.

20-03 CONSERVATION OF TOPSOIL: Where indicated on the drawings or directed by the Contracting Officer, topsoil shall be carefully removed, transported and deposited in storage piles convenient to the areas which are subsequently to receive application of topsoil. The topsoil shall be excavated to a depth of 4 inches. Topsoil, when stored, shall be kept separate from other excavated materials and shall be piled free of roots, stones, and other undesirable material.

20-04 CLASSIFICATION OF EXCAVATION: All excavation as hereinafter specified shall be executed on unclassified basis, in which case no consideration will be given to the nature of the materials. All excavation shall be designated as unclassified excavation, which shall comprise and include the satisfactory removal and disposition of all materials excavated regardless of the nature of the materials encountered, and which shall, therefore, be understood to include both rock excavation and common excavation when both classes are present. Neither the condition of the material at the time it is excavated nor the manner in which it is excavated will have any bearing on, or will be given any consideration in the classifying of the excavation.

20-05 GENERAL EXCAVATION: After all stripping has been done, excavation of every description and of whatever substances encountered within the grading limits of the project shall be performed to the lines and grades indicated on the drawings, or as directed by the Contracting Officer. All suitable excavated material shall be transported to and placed in the fill areas within the limits of the work as specified and as shown on the drawings, or as otherwise directed by the Contracting Officer. Where material encountered within the limits of the work is considered unsuitable by the Contracting Officer, such material shall be excavated below the grade shown on the drawings or as directed by the Contracting Officer, and replaced with suitable material. All such

material excavated and the material used for backfilling shall be included in and will be paid for as excavation. All excavated materials which are considered unsuitable by the Contracting Officer and any surplus of excavated material which is not required for fill shall be known as "waste," and shall be disposed of by the Contractor at his own expense and responsibility, and to the satisfaction of the Contracting Officer. Unless otherwise directed by the Contracting Officer, all waste shall be disposed of outside the limits of the work. During construction, excavation and filling shall be performed in a manner and sequence that will provide drainage at all times. Material required for fills in excess of that produced by normal grading operations shall be excavated from areas selected by the Contractor and approved by the Contracting Officer, as specified below.

20-06 ROCK FOR SLOPE PROTECTION: Coarse rock from excavations shall be conserved and used for constructing the slopes of embankments parallel or adjacent to streams, and for constructing the slopes or sides and bottom of channels, for protection against erosion, as indicated on the drawings. Hand placing of coarse rock from excavation will not be required.

20-07 SELECTION OF BORROW MATERIAL: Borrow material shall be selected to meet the requirements and conditions of the particular fill for which it is to be used. Borrow material shall be obtained from sources selected by the Contractor, subject to the approval of the Contracting Officer. The Contractor shall obtain from the owners the right to procure material from sources other than Government-controlled lands, shall pay all royalty and other charges involved, and shall bear all the expense of developing the sources, including rights-of-way for hauling. Unless specifically provided for on the drawings, no borrow shall be obtained within the limits of the project site without prior written approval of the Contracting Officer. The necessary clearing and grubbing of borrow pits, burning and disposal of debris therefrom, and satisfactory drainage of borrow pits shall be considered as incidental operations to the borrow excavation, and shall be performed by the contractor at no additional cost to the Government.

20-08 OPENING AND DRAINAGE OF BORROW PITS: The Contractor shall notify the Contracting Officer sufficiently in advance of the opening of any excavation or borrow pit, to permit elevations and measurements of the undistrubed ground surface to be taken. Except as otherwise permitted by the Contracting Officer, borrow pits, like other excavated areas, shall be excavated in such manner as will afford adequate drainage. Overburden and other spoil material shall be disposed of or may be used for special purposes, if so directed by the Contracting Officer. All borrow pits shall be neatly trimmed and left in such shape as will facilitate accurate measurements being taken after the excavation is completed.

20-09 EXCAVATION OF DITCHES AND GUTTERS: Ditches and gutters shall be cut accurately to the cross sections and grades indicated on the drawings. All roots, stumps, and foreign matter in the sides and bottom of ditches and gutters shall be cut to conform to the slope, grade, and shape of the section shown. Care shall be taken not to excavate ditches and gutters below the

grades indicated. Any excessive ditch and gutter excavation shall be backfilled to grade either with suitable, thoroughly compacted material, or with suitable stone or cobble to form an adequate gutter paving, as directed by the Contracting Officer. The Contractor shall maintain all ditches and gutters excavated under this specification free from detrimental quantities of leaves, sticks, and other debris until final acceptance of the work. All suitable material excavated from ditches and channel changes, except material shown on the drawings to be placed in dikes, shall be placed in fill areas unless otherwise directed by the Contracting Officer. No excavated material shall be deposited within 3 feet from the edge of the ditch.

20-10 PROTECTION OF EXISTING SERVICE LINES AND UTILITIES STRUCTURES: The existing service lines and utilities structures shown on the drawings, the location of which is known to the Contractor prior to excavation or construction of fills or embankments, shall be protected and safeguarded from damage during grading operations and if damaged, shall be repaired by the contractor at his expense. The above provisions are applicable to all service lines or utilities structures, all or any portion of which protrudes above the original ground surface or lies beneath the ground surface within any grading area. Any existing line or utility structure which is not shown on the drawings or the location of which is not known to the Contractor in sufficient time to avoid damage, if inadvertently damaged, shall be repaired by the Contractor, and an adjustment in payment will be made by the Government at rates determined and approved by the Contracting Officer. If extra expense is incurred by the Contractor in protecting and safeguarding any service line or utility structure which is not shown on the drawings and is not known at the time of bidding, adjustment in payment will be made by the Government at the rates determined and approved by the Contracting Officer.

20-11 BACKFILL ADJACENT TO STRUCTURES: Symmetrical backfill loading shall be maintained. Special care shall be taken to prevent any wedging action or eccentric loading upon or against the structure, and all slopes bounding or within the areas to be backfilled shall be stepped or serrated to prevent such wedging action. During backfilling operations, and in the formation of embankments, care shall be exercised that the equipment used will not overload the structure in passing over and compacting these fills. Backfill for structures other than culverts and drains shall conform to the additional requirements of Section of these specifications.

20-12 OVERHAUL: No overhaul will be authorized by the Contracting Officer, of acceptable excavation or borrow materials.

20-13 PREPARATION OF GROUND SURFACE FOR FILL: All vegetation, such as roots, brush, heavy sods, heavy growth of grass, and all decayed vegetable matter, rubbish, and other unsuitable material within the area upon which fill is to be placed, shall be stripped or otherwise removed before the fill is started. In no case will such objectionable material be allowed to remain in or under the fill area. Sloped ground surfaces steeper than one vertical to four horizontal on which fill is to be placed, shall be plowed, stepped (benched), or broken up in such manner that the fill material will bond with the existing surface, as directed or approved by the Contracting Officer. Prepared surfaces shall be wetted and compacted when so directed by the Contracting Officer.

20-14 FILL: Fills, or embankments herein designated as fills, shall be constructed at the locations and to the lines and grades indicated on the drawings and as directed by the Contracting Officer. The completed fill shall correspond to the shape of the typical sections shown on the drawings or shall meet the requirements of the particular case. All suitable material removed from the excavation shall be used in forming the necessary fill. All fill material shall be reasonably free from roots or other organic material, trash, frozen material, and from all stones having a maximum dimension greater than 6 inches. Stones larger than 4 inches, maximum dimension, shall not be permitted in the upper 6 inches of fill or embankment. The material shall be placed in successive horizontal layers of from 8 inches to 12 inches in loose depth, as specified or as directed by the Contracting Officer, for the full width of the cross section.

20-15 COMPACTION: Each layer of all fills and embankments shall be compacted by rolling with an approved tamping roller or three-wheeled power roller, or where so specified and approved by the Contracting Officer, by the construction equipment, to at least 95 percent of maximum density at optimum moisture content, determined by A.A.S.H.O. Standard Method T 99-49, with the following modifications:

a. The mold shall be 6 inches in diameter and 7 inches high. A metal spacer disk 5-15/16 inches in diameter and 2-1/2 inches high shall be used as a false bottom in the mold during compaction.

b. In lieu of removing all material retained on a No. 4 sieve, all material over 3/4 inch in size shall be removed and replaced with an equal portion of material between 0.18 inch (No. 4 sieve) and 3/4 inch in size.

c. The weight of the rammer or metal tamper shall be 10 pounds instead of 5.5 pounds, and the tamper shall be dropped from a height of 18 inches instead of 12 inches.

d. The samples shall be compacted in five layers, each approximately 1 inch thick and each layer receiving 55 blows with the specified tamper.

e. A separate batch of soil shall be used for each compaction test specimen. No material shall be reused.

20-16 FINISHED EXCAVATION, FILLS, AND EMBANKMENTS: Uniformly smooth grading of all areas covered by the project, including excavated and filled sections and adjacent transition areas, shall be accomplished. The finished surface shall be reasonably smooth, compacted, and free from irregular surface changes. The degree of finish shall be that ordinarily obtainable from either blade-grader or scraper operations, except as otherwise specified. The finished surface shall be not more than 0.15 foot above or below the established grade or approved cross section. All ditches and gutters shall be finished so as to drain readily. The surface of areas to be sodded shall be finished to a smoothness suitable for the application of sodding materials. The surface of embankments or excavated areas for road construction or other areas to be paved, on which a base course or pavement is to be placed, shall not vary more than 0.05 foot from the established grade and approved cross section.

20-17 PROTECTION: Newly graded areas shall be protected from the action of the elements, and any settlement or washing that may occur from that or any other cause, prior to acceptance of the work, shall be repaired, and grades reestablished to the required elevations and slopes.

20-18 TRENCH EXCAVATION:

a. General: The Contractor shall perform all excavation of every description and of whatever substances encountered, to the depths indicated on the drawings or as otherwise specified. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. All excavated materials not required or suitable for backfill shall be removed and wasted as indicated on the drawings or as directed by the Contracting Officer. Such grading shall be done as may be necessary to prevent surface water from flowing into trenches or other excavations, and any water accumulating therein shall be removed by pumping or by other approved method. Such sheeting and shoring shall be done as may be necessary for the protection of the work and for the safety of personnel. Unless otherwise indicated, excavation shall be by open cut.

b. Trenches shall be of necessary width for the proper laying of the pipe, and the banks shall be as nearly vertical as practicable. The bottom of the trenches shall be accurately graded to provide uniform bearing and support for each section of the pipe on undisturbed soil at every point along its entire length, except for the portions of the pipe sections where it is necessary to excavate for bell holes and for the proper sealing of pipe joints. Bell holes and depressions for joints shall be dug after the trench bottom has been graded and, in order that the pipe rest upon the prepared bottom for as nearly its full length as practicable, shall be only of such length, depth, and width as required for properly making the particular type of joint. Except where rock is encountered, care shall be taken not to excavate below the depths indicated. Where rock excavation is required, the rock shall be excavated to a minimum overdepth of 4 inches below the trench depths indicated on the drawings or specified. Overdepths in the rock excavation and unauthorized overdepths shall be backfilled with loose, granular, moist earth, thoroughly tamped. Whenever wet or otherwise unstable soil that is incapable of properly supporting the pipe, as determined by the Contracting Officer, is encountered in the bottom of the trench, such soil shall be removed to the depth required and the trench backfilled to the proper grade with coarse sand, fine gravel, or other suitable material, as hereinafter specified. Special requirements relating to specific utilities are as follows:

(1) Sanitary sewers: For sanitary sewers, the width of the trench at and below the top of the pipe shall be such that the clear space between the barrel of the pipe and the trench wall shall not exceed 8 inches on either side of the pipe. The width of the trench above that level may be as wide as necessary for sheeting and bracing and the proper performance of the work. The bottom of the trench shall be rounded so that at least the bottom quadrant of the pipe shall rest firmly on undisturbed soil for as nearly the full length of the barrel as proper jointing operations will permit. This part of the excavation shall be done manually only a few feet in advance of the pipe laying by men skilled in this type of work.

(2) Water supply and distribution lines: Except in cases where water lines must be graded, as indicated on plans, to avoid high points with the necessity of placing air release and vacuum valves, trenches for water lines shall be of a depth that will provide a minimum cover over the top of the pipe of 2½ feet from the existing ground surface or the indicated finished grade, whichever is lower, and avoid interference of the water lines with other utilities.

(3) Concrete-encased duct work: The trenches in which concrete-encased duct work is to be placed shall, in general, not be wider than necessary for proper placing of such work. However, the banks of such trenches need not be kept vertical but may be sloped or widened to such limits as may be set by the Contracting Officer and which will not interfere with other utilities. Overexcavating and backfilling with suitable selected material where rock is encountered will not be required except for a gradual cushioning towards points of abrupt drop-off of the rock to levels considerably below the grade of the duct.

c. Excavation for appurtenances: Excavation for manholes and similar structures shall be sufficient to leave at least 12 inches in the clear between their outer surfaces and the embankment or timber which may be used to hold and protect the banks. Any overdepth excavation below such appurtenances that has not been directed by the Contracting Officer shall be considered as unauthorized and shall be filled with sand, gravel, or concrete as directed and at the expense of the contractor.

20-19 BACKFILLING FOR UTILITIES SYSTEMS: The trenches shall not be backfilled until all required pressure tests are performed and until the utilities systems as installed conform to the requirements specified in the several sections covering the installation of the various utilities. Where, in the opinion of the Contracting Officer, damage is likely to result from withdrawing sheeting, the sheeting shall be left in place and the contract price will be adjusted accordingly. The trenches shall be carefully backfilled with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand and gravel, soft shale, or other approved materials, free from large clods of earth or stones, deposited in 6-inch layers and thoroughly and carefully rammed until the pipe has a cover of not less than 1 foot for water mains, gas mains, steam lines, or electric ducts, and 2 feet for sewer mains. Where the pipe is specially coated for protection against corrosion, care shall be taken not to damage the coating. The remainder of the backfill material shall then be thrown into the trench in 1-foot layers and tamped. Settling the backfill with water will be permitted, and will be a requirement when so directed by the Contracting Officer. Any trenches improperly backfilled, or where settlement occurs, shall be reopened to the depth required for proper compaction, then refilled and compacted, with the surface restored to the required grade and compaction, mounded over, and smoothed off. Open trenches across roadways or other areas to be paved shall be backfilled as specified above, except that the entire depth of trench shall be backfilled in 6-inch layers, and each layer shall be moistened and compacted to a density at least equal to that of the surrounding earth and in such manner as to permit the rolling and compaction of the filled trench with the adjoining earth to provide the required bearing value, so that paving of the area can proceed immediately after backfilling is completed. Along all other pretions of the trenches, the ground shall be

graded to a reasonable uniformity and the mounding over the trenches left in a uniform and neat condition to the satisfaction of the Contracting Officer.

a. Test for displacement of sewers: Sewer mains will be checked by the Contracting Officer to determine whether any displacement of the pipe has occurred after the trench has been backfilled to 2 feet above the pipe and tamped as specified. The test will be as follows: A light will be flashed between manholes, or, if the manholes have not as yet been constructed, between the locations of the manholes, by means of a flashight or by reflecting sunlight with a mirror. If the illuminated interior of the pipe line shows poor alinement, displaced pipe, or any other defects, the defects designated by the Contracting Officer shall be remedied by the contractor at his expense.